BridgeMaster E Radar

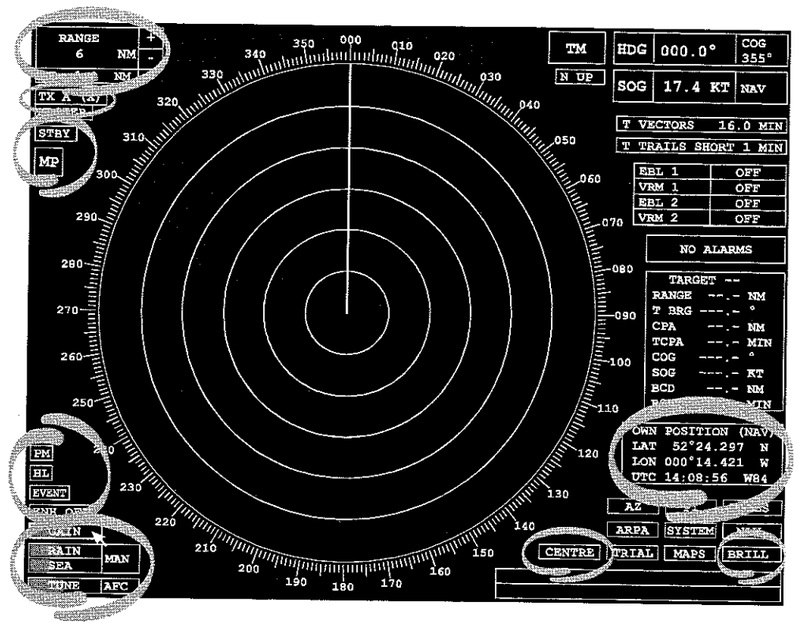
User Guide

Part Number 65800010A-4
Publication Rev.A
Software Version 3.xx or SC1.xx

Litton
Marine Systems

Intentionally Blank

CHAPTER 3
Basic Operation

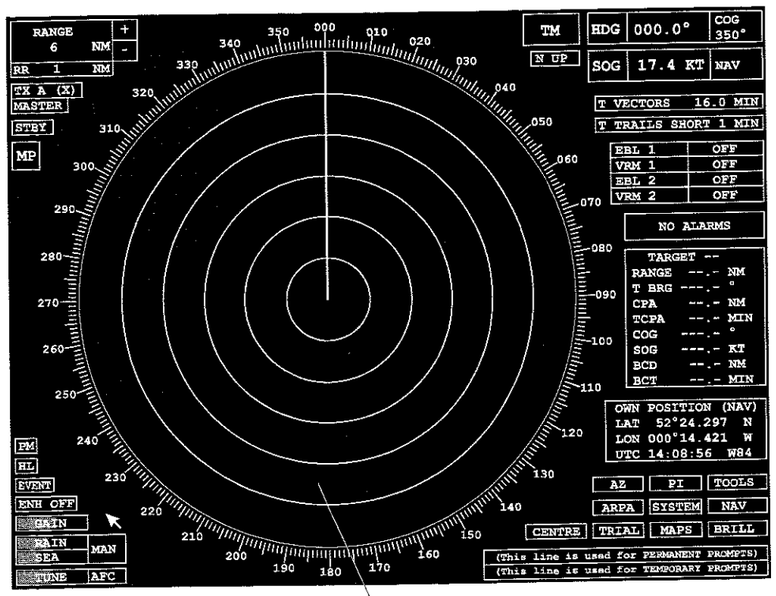


Covered in this chapter:

- A description of transmit mode and returning to standby mode.
- Displaying user data on own ship.
- Selecting the radar range and displaying range rings in the video circle.
- Off-centring own ship in the video circle.
- Tuning the transceiver.
- Using the video processing controls.
- Setting the pulse length of radar transmission.
- Monitoring the radar's performance.
- Recording events.
- Selecting the display's intensity for day or night operation and setting the brilliance.
- Controlling the interswitch.

Introduction

When TRANSMIT is selected from Standby, the system is switched to transmit. Slave radars can only be set to transmit if the associated Master is already transmitting.



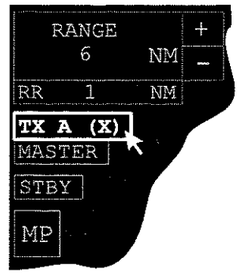
TRANSMIT Display Video Circle

Most of the captions and soft keys associated with the TRANSMIT display are available for selection, and are highlighted individually as the screen cursor moves over them.

Most of the basic radar functions are covered in this chapter. Other, more specific functions are covered in individual chapters.

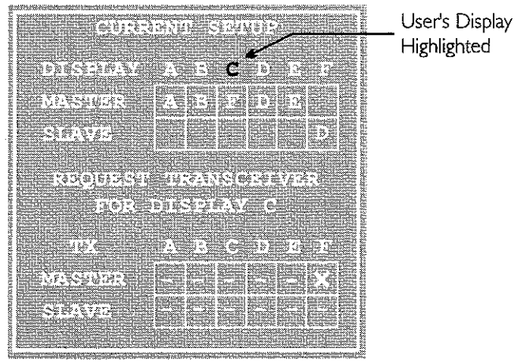
Transceiver Selection (Optional)

Your display may be configured to operate with one of six transceivers (labelled A to F) located at different positions on the ship. Each transceiver may be either X-Band or S-Band.



The Transceiver (TX) soft key, in the top left hand corner of the display, normally gives an indication only of the selected transceiver depending on the system configuration (see Ship's Manual, Chapter 3).

If an Interswitch is fitted, a left click on this soft key at any of the displays in the system will reveal a drop down menu containing the current operational transceiver/display configuration of the **whole system** with the **user's display** highlighted, see example below.



The example above shows the layout for a 6-way 65846 Interswitch. A 2-way 65842 Interswitch would show 2 transceivers and 4 displays.

The 'Request Transceiver . . .' part of the menu, allows the user to select another transceiver for display. A left click in the appropriate dashed box will select the user's display as Master or Slave to that transceiver, and mark the selection with a cross. All fields in the current setup are then updated accordingly.

Note *- An invalid selection prompt will appear if slave status is selected for a transceiver that is currently unassigned to a display.*

A left click on the transceiver letter will display the position of that transceiver in the prompt line, see examples below.

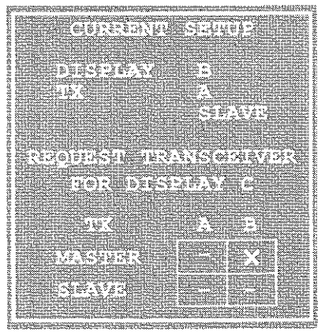
Note *- The transceiver type (X- or S-Band) will only appear if that particular transceiver has been selected for display since switch-on.*

The possible options for transceiver position, as determined from stored turning unit offsets (see Ship's Manual, Chapter 4) are as follows:

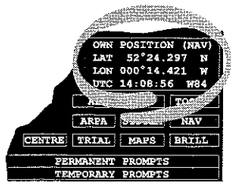
'FWD', 'FWD PORT', 'FWD STBD',
'AFT', 'AFT PORT' 'AFT STBD',
'MID' 'MID PORT', 'MID STBD'

A right click will close the menu.

If a BridgeMaster Interswitch 65642 is fitted, only information for the operator's display is available and a left click will reveal the following drop down menu.



User Specified Data



The user data area of the display is located at the bottom right hand side, above the help area and function soft keys. The area is used to show information relating to own ship and is available in both Standby and Transmit modes.

The following types of data can be displayed,
- Own Ship's Position
- Waypoint Data
- Wind and Depth

Note *- Waypoint and 'Wind and Depth' data are only available if the appropriate sensor inputs were selected during initialisation. See Ship's Manual, Chapter 4.*

Selecting the Data Type

1. Position the screen cursor over the top line of text in the User Data box.
2. Left click to select the type of data required.
   Each click will cycle the display to the next type.
   Alternatively a right click will reveal a drop down menu containing a list of data types, left click on the type required, or right click to close the menu without further action.

Data Displays

An example of each type of data display is given below. When specific data is unavailable, the associated readout is replaced with dashes.

Own Ship's Position

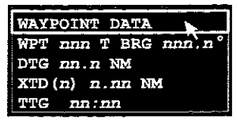
The 'source' display, in brackets after the title, depends on the external positioning input configured during initialisation (see Ship's Manual, Chapter 4) and/or the position mode selected (see Chapter 9).

The source can be any one of the following:
(DGPS), (GPS), (DEC), (LOR), (DR) or (EP).
(NAV) is shown if an unknown navigational input is being used.

Note that the position displayed here is the position of the centre of the ship. Any waypoint data given on the display will be related to this point. This position will differ slightly from that shown on the navigation sensor's own internal display, given that the correct sensor offsets have been entered into the Radar Display during initialisation, unless the navigation sensor's antenna is actually sited at the centre of the ship. The co-ordinates of the navigation sensor's antenna relative to the centre of the ship, if entered during initialisation, enable the true position of Own Ship's Centre to be displayed.

UTC/LOC time and the lat/lon datum are set up within the Navigation function. If UTC is received from the nav sensor, then it is UTC time which is displayed, irrespective of any time entered by the operator, see Chapter 9.

If there is a Position alarm, the lat/lon is displayed in **RED**.



Waypoint Data

The information displayed in this menu is dependant on the route set up configured within the Navigation function, see Chapter 9.

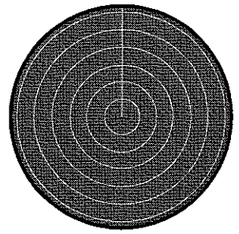
When information is displayed, it relates to the next waypoint in the current route as follows:

WPT	The number of the NEXT waypoint in the current route.
T BRG	True Bearing of waypoint from own ship.
DTG	Distance To Go to waypoint (in nm or km).
XTD	Cross Track Distance (**L**eft or **R**ight) (in nm or km).
TTG	Time-to-go to waypoint (in hh.mm).

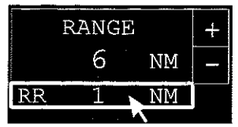
Wind and Depth

This 'menu' is only available if either or both inputs are configured during Initialisation. See Ship's Manual, Chapter 4. Either TRUE or REL (Relative) wind speed is displayed depending on the data received from the sensor. The wind bearing is displayed relative to own ship's heading.

Range Scales & Range Rings



The radar range scale can be selected from a list of preset values. A set of fixed range rings, displayed as a number of equally spaced concentric circles (normally six), can also be switched ON or OFF. Range scale selection can be made in both Standby and Transmit modes. Range rings cannot be selected or displayed in Standby.



The current range scale and range ring selections are given in the top left hand corner of the display. The ranges are either displayed in nm, km or sm, as selected during Initialisation, see Ship's Manual, Chapter 4.

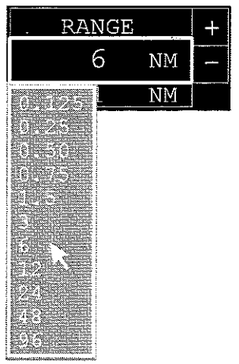
Choosing the Appropriate RANGE Scale

To ensure the best detection of small targets amongst sea clutter, always select the shortest range scale consistent with operational requirements.

Selecting a Range Scale

Ranges can be selected by using either the + and - soft keys, or by using a drop down menu.

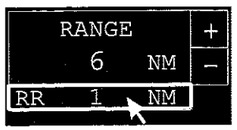
1. Position the screen cursor over the + (or -) symbol.
2. Left click to select the next (or previous) range scale.
   Ranges from 0.125 to 96 nm. (0.25 to 192 km) are available.
   An appropriate prompt is displayed when the upper or lower limit is reached



Alternatively a left click on the Range field, will reveal a drop down menu listing the ranges available, with the current selection highlighted. Left click on the range required, or right click to close the menu without further action.

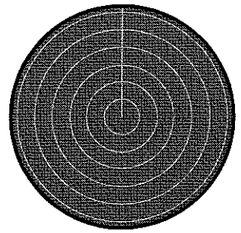
Turning Range Rings ON and OFF

The separation between the range rings (RR) is indicated under the Range field.



To turn the range rings ON or OFF,

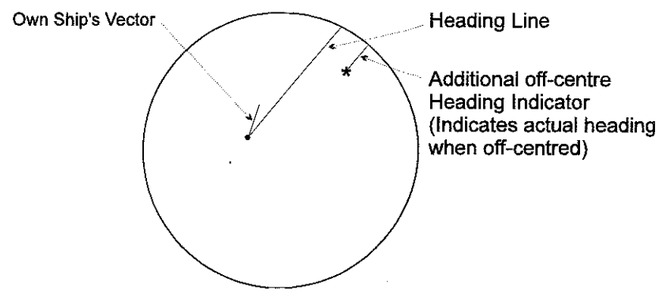
1. Position the screen cursor over the Range Ring field.
2. Left click to toggle rings ON or OFF.

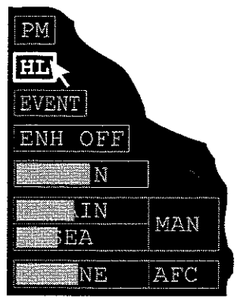


Heading Line (HL)

The ship's heading line is shown as a single line centred on own ship and drawn to the edge of the video circle. In the Head-up presentation mode (see Chapter 5) the line is always drawn at 000.0°.

When own ship is off-centred, an additional indication of own ship's heading is shown by an asterisk and a short line drawn just inside the video circle.





Stern Line (SL)

During Initialisation, the heading line can be configured as a Stern Line drawn behind own ship, see Ship's Manual, Chapter 4. The type of line displayed is indicated by whether HL or SL is written in the soft key at the left side of the display, see example left. This function cannot be changed from the TRANSMIT display. However, the line can be turned on/off as described below.

Temporarily Hiding the Heading/Stern Line

The heading/stern line can be removed temporarily, to view more clearly something which is on, or close to, the line.

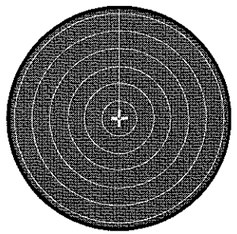
1. Position the screen cursor over the HL (or SL) soft key.
2. Press and hold down the left key.
   The line, together with all of the synthetics within the video circle, remains hidden as long as the key is held down.
3. Release the key to return the line and synthetics to the video circle.

Off-centring the Picture

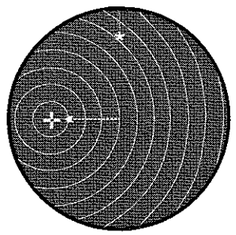
The default picture is with own ship placed at the centre of the video circle. However, the picture can be off-centred by 'dragging' own ship to a new position within the video circle as follows.

The video display can be off-centred by up to two thirds of the range scale radius.

1. Position the video cursor over own ship's position.
2. Press and hold down the left key.
3. Drag own ship to the required off-centred position.
4. Release the key.



Position cursor over 'Own Ship'



Left key press and drag to new position

Centring the Video Display

The CENTRE soft key, located near the bottom right hand corner, can be used to redraw the display with own ship at the centre of the video circle, or to reposition own ship for maximum view along own ship's course.

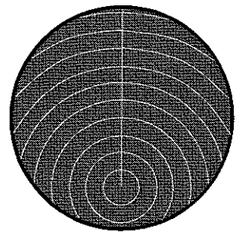
To Centre the Display

1. Position the screen cursor over the CENTRE soft key.
2. Left click to place own ship at the centre of the video circle.

For Maximum View

1. Position the screen cursor over the CENTRE soft key.
2. Right click to reveal a pop up menu containing the 'Max View ' option, see example left.

3. Left click to select Max View, or right click to close the menu without further action.



When Max View is selected, the video display is off-centred by two thirds of the range scale radius.

Transceiver Tuning

The transceiver tuning indicator is located in the bottom left hand corner of the display. The current level of tuning is indicated by the shaded bar behind the TUNE caption. This bar indicates the level in percentage terms with 0% on the left, 100% on the right. The tuning indicator is only displayed when the radar is in Transmit mode, and can only be adjusted manually if the system is configured as a Master radar. Coarse tuning is set up from the System menu during initialisation.

Selecting Manual or Automatic Tuning

Only applicable for Master radars. The system defaults to the mode of tuning last selected (MAN or AFC).

1. Position the screen cursor over the AFC/MAN selection field.
2. Left click to toggle the tuning control to MAN (Manual) or AFC (Automatic Frequency Control).

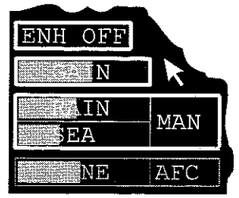
Manual change of Fine Tuning Control

Only applicable for Master radars.

1. Position the screen cursor over the TUNE caption.
2. Left click to make the bar active. The bar will appear yellow.
3. Move the cursor control left or right to tune the receiver for best results.

Note *- The yellow bar in this case is a tuning level indicator and is a 'tell back' (an indication only) from the receiver. The cursor control is used to tune the receiver, not unlike tuning a radio for a particular station. However, there is no direct correlation between the tuning control and the tuning indicator; increasing the level of control does NOT necessarily result in a higher level of tuning.*

4. Left click to set the level and de-activate the bar. The bar will return to its dimmed shaded state.



Video Processing Controls

The video processing controls are located in the bottom left hand corner of the display.

Video Gain and Anti-Clutter Controls

The video GAIN control, and the anti-clutter (RAIN & SEA) controls when set to Manual (MAN), can be adjusted independently. Each control is adjusted using the shaded bar behind its associated caption which indicates the level in percentage terms with 0% on the left, 100% on the right.

Using the Video GAIN Control

Always adjust the GAIN setting while on the longer range scales of 12 or 24 nm. (24 to 48 km). A light background speckle **must** be present to achieve the best target detection and long range performance. A **temporary** reduction in gain can be beneficial when searching for targets in rain or snow conditions. Video gain is independently adjustable for AUTO and MAN anti-clutter modes.

Using the Manual Anti-Clutter SEA Control

Use the Anti-Clutter SEA control to reduce sea clutter to an operational level where some residual clutter speckle is present. The setting must permit small targets, often of similar signal strength to the sea clutter returns, to be detected.

Always use the control with great care. Avoid setting the control to completely remove all sea clutter, as this will reduce the detection of small targets. The setting should be periodically checked as prevailing sea conditions change.

Using the Manual Anti-Clutter RAIN Control

Use the Anti-Clutter RAIN control to optimise suppression of rain clutter, i.e. balance the detection of targets within the clutter region (under the rain) with detection of those outside the clutter region. Always use the control with great care. Excessive suppression can cause loss of small targets. It is often advantageous to use this control to search for targets in the clutter region, returning the control to zero after the search.

Using the Automatic Anti-Clutter Control

In open sea conditions, use AUTO to suppress rain and sea clutter. This normally provides optimum detection by adapting the amount of clutter suppression applied to the varying characteristics of clutter returns.

Pulses received from radar transponders are subject to slight degradation. However, they are still easily recognisable by their signal strength.

Selecting Manual or Automatic Anti-Clutter Control

1. Position the screen cursor over the MAN/AUTO selection field.
2. Left click to toggle control to MAN (manual) or AUTO (automatic).

Manual Change of GAIN, RAIN & SEA Settings

1. Position the screen cursor over the control you wish to change.
2. Left click to make control bar active. The bar will appear yellow.
3. Move the cursor control left or right to move the bar to the level required.
4. Left click to set the level and de-activate the bar. The bar will return to its dimmed shaded state.

Note *- Rain and Sea settings cannot be changed in AUTO mode.*

Enhanced Video Mode

A substantial improvement in the presentation of small and/or short range targets, especially when operating at range scales of 3 nm (6 km) and above, can normally be achieved by selecting the enhanced video mode. This facility is available on range scales 0.75 nm and above. Targets are not enhanced close to own ship.

Using the Enhanced Video Mode

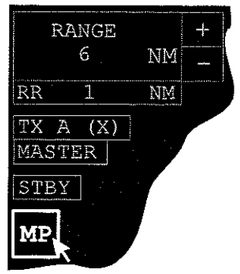
In estuary and open sea conditions, always use the enhanced video mode for best target detection. This will enhance small targets, significantly improving their perceptibility on the display at all ranges, especially on range scales of 3 nm. (6 km) and above.

WARNING *- USE THE ENHANCE CONTROL WITH CAUTION. IF USED ON SHORT RANGE SCALES IT WILL DEGRADE TARGET DISCRIMINATION.*

Turning Enhanced Video Control ON and OFF

1. Position the screen cursor over the Enhance (ENH) soft key.
2. Left click to toggle the Enhance control ON or OFF.

Radar Transmission Pulse Length



The current selection of pulse length is indicated in the 'pulse length' soft key at the left hand side of the display. The caption in the soft key box is an abbreviation of the current pulse length selection, SP (Short Pulse), MP (Medium Pulse) or LP (Long Pulse). The soft key is not displayed in Standby mode, and the pulse length can only be manually changed if the system is configured as a Master.

Selecting the Required Pulse Length

1. Position the screen cursor over the Pulse Length soft key.
2. Left click to cycle to the pulse length required.
   The caption will cycle in a SP, MP, LP, SP sequence if all three are available. Only pulse lengths that are valid for the selected range can be selected.

Alternatively, a right click on the soft key, will reveal a drop down menu listing the pulse lengths available, with the current selection highlighted. Left click on the length required, or right click to close the menu without further action.

Events

The EVENT soft key is only active if tracks (own ship/target) are being recorded.

A left click on the EVENT soft key records the lat/long position of own ship and each selected track. Current time is also recorded. If the tracks are currently being displayed, the event will be shown in the video circle, see Chapter 9.

Brilliance Control

The BRILL soft key, located in the bottom right hand corner of the display, is used to select day or night brilliance and to set the level of display intensity for different components of the display.

Note *- The display monitor has its own associated brilliance control which you may need to adjust.*

A right click on the BRILL soft key will reveal a drop down menu listing the DAY/NIGHT brilliance options available (1 day-time level and 3 night-time levels). Left click on the setting required. See example left. To set the display intensity for different components of the display, proceed as follows.

1. Position the screen cursor over the BRILL soft key.
2. Left click to reveal the BRILLIANCE menu. See example left.

The menu lists the various components of the display for which the brilliance can be set independently.

The first line of the menu, under the heading, indicates the DAY/NIGHT brilliance option to which the menu settings apply.

The settings are independently stored for each DAY/NIGHT brilliance option, and are retained on switch-off.

Day/Night Selection

One of four different pre-set levels of display intensity can be selected (one day-time level and three night-time levels).

1. Position the screen cursor over the first line in the menu (Night 1 in the example left).
2. Left click to cycle through the settings available. The display intensity will change with each click in a sequence of NIGHT1, NIGHT2, NIGHT3, NIGHT1. See note on next page.

Alternatively, a right click will reveal a drop down menu listing the settings available. Left click on the setting required. See example left.

Note *- This method of selection is normally used to switch between night-time settings; the day-time setting can only be selected from the drop down menu.*

Changing the Relative Brilliance Settings

1. Within the menu, position the screen cursor over the item you wish to change.
2. Left click to make the control bar active. The bar will appear yellow.
3. Move the cursor control left or right to move the bar to the level required.
4. Left click to de-activate the bar. The bar will return to its dimmed shaded state.

Returning to the Default Brilliance Settings

1. Position the screen cursor on the DEFAULT BRILLIANCE soft key.
2. Left click to return to the default (i.e. factory set) relative brilliance levels.

Note *- If the brilliance controls are not providing adequate control of the display, the monitor may need adjusting (see Monitor Testing in Ship's Manual, Chapter 5).*

Panel Brilliance

The lighting brilliance of the Radar Control Panel is controlled by the PANEL BRILL (+ and -) soft keys.

1. Left click on the PANEL BRILL + soft key to INCREASE the brilliance.
2. Left click on the PANEL BRILL - soft key to DECREASE the brilliance.

Note *- If a dedicated control panel is fitted (see Chapters 1 and 2), the PANEL BRILL soft keys do NOT appear below the brilliance menu. In this case, panel brilliance is controlled from the dedicated control panel.*

Exiting the Brilliance Menu

1. Position the screen cursor over the EXIT BRILLIANCE soft key located directly under the menu.
2. Left click to exit.

Performance Monitoring

The Performance Monitoring facility is only available if the display is a Master display connected to a transceiver fitted with performance monitoring equipment. See Ship's Manual, Chapter 4. The facility is not available in Standby mode.

Note *- Selecting PERF MONITOR from the System menu is for setting up the Performance Monitor only. Refer to Ship's Manual for further details.*

Two modes are provided, a SYSTEM Mode which monitors the performance of the overall system, and an RX Mode which monitors the receiver path for incoming signals, including the receiver located in the Transceiver unit.

Access to the monitor facility is provided by the Performance Monitor (PM) soft key located at the left hand side of the display.

Viewing the Performance Monitor

1. Position the screen cursor over the PM soft key.
2. Left click to reveal the Performance Monitor drop down menu. A further right click will close the menu without further action.
3. Position the screen cursor over the MODE caption in the menu.
4. Left click to toggle the mode for SYSTEM or RX.

Note *- When the PM drop down menu is displayed, four arcs are shown on the radar screen. These arcs are approximately 0.3 nm. apart and start at 8 nm. The arcs extend from 290° to 320° (S-Band), or 155° to 185° (X-Band), with respect to the heading line. The arcs are spaced at 5dB intervals and, for example, if performance decreases below the second arc, this shows a 10dB drop in performance.*

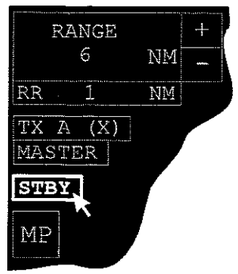
The level of PM tuning voltage is indicated by the control bar above the MODE SYSTEM or MODE RX caption in the PM menu. This bar indicates the tuning level in percentage terms with 0% on the left, 100% on the right.

If for a period of 10 seconds, neither key (left or right) is pressed or the screen cursor is not moved, then the PM drop down menu is removed from display automatically.

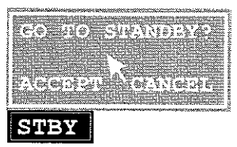
Warning Prompt

If sector blanking is active, the warning prompt shown below is displayed continually while the Performance Monitor drop down menu is displayed.

Returning to Standby Mode



The Standby (STBY) soft key, located at the top left hand side of the display, is used to return the display to Standby mode. See Chapter 2.

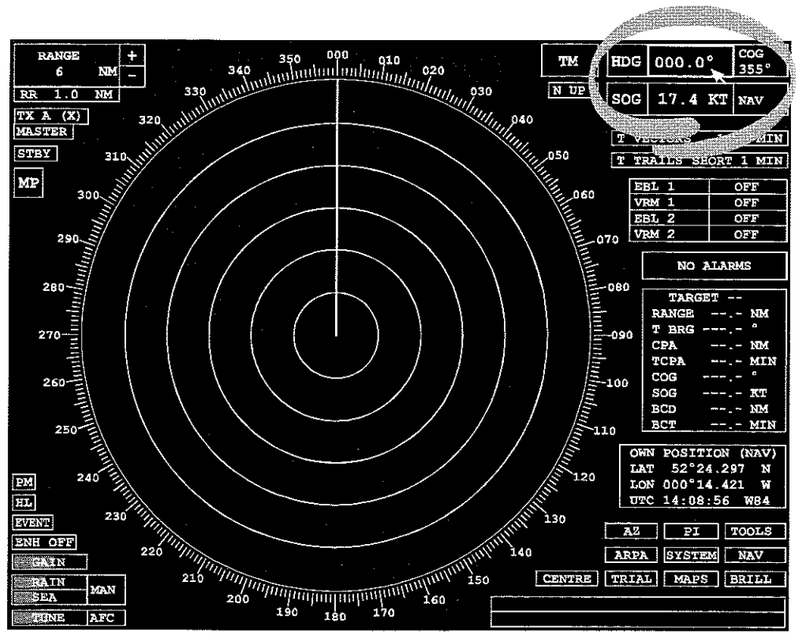


1. Position the screen cursor over the STBY soft key.
2. Left click to reveal the Standby menu.
3. Position the screen cursor over the ACCEPT caption and left click.

Note *- When the menu is displayed, a left click on the CANCEL caption, will close the menu and leave the system in TRANSMIT mode.*

Intentionally Blank

CHAPTER 4
Ship's Heading and Speed

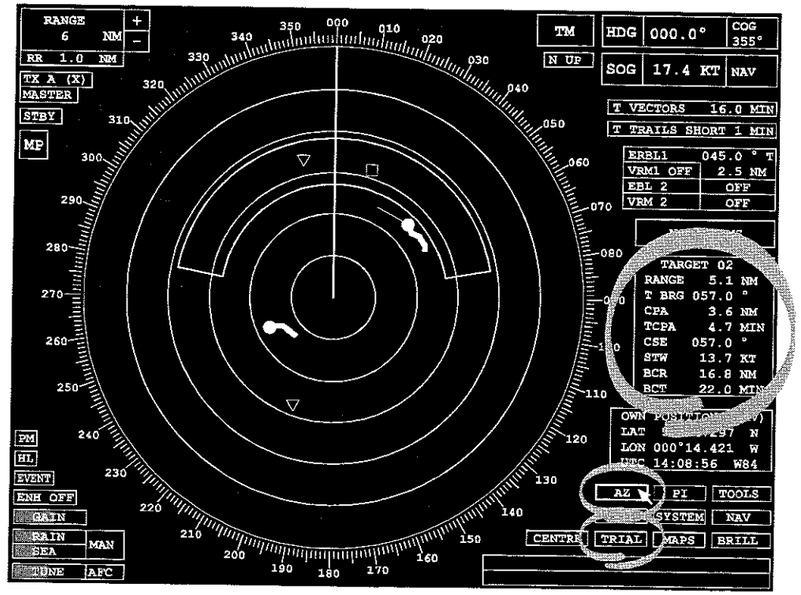


Covered in this chapter:

- The information shown in the heading display.
- The information shown in the speed display.
- Selecting a speed mode.

Intentionally Blank

CHAPTER 7
Target Functions



Covered in this chapter:

- Plotting a target by manually plotting its position at intervals.
- Manually acquiring a target for tracking.
- Automatically acquiring a target for tracking using auto-acquisition zones.
- Defining auto-acquisition and guard zones.
- Displaying target data.
- Running a trial manoeuvre to view the effect of proposed manoeuvre of own ship.

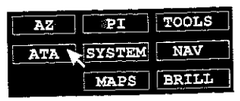
Introduction

In transmit mode, any target that appears on the radar display within 40 nm can be plotted or tracked. The method used is either manual target plotting (EPA radars only) or target acquisition and auto-tracking (ATA and ARPA radars only). Once a target has been plotted or acquired, information relating to the target's proximity to own ship and its speed and bearing is maintained until the target is 'cancelled'.

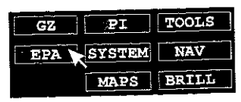
Information on one or more tracked targets can be displayed in a target box - see **Target Data** later in this chapter.

An indication of how your radar is configured is given by the caption in the radar function soft key, see examples left.

The caption will show **ARPA** (Automatic Radar Plotting Aid),



or **ATA** (Automatic Tracking Aid)



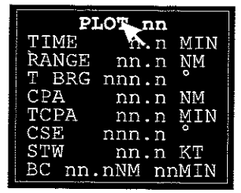
or **EPA** (Electronic Plotting Aid) as appropriate.

In this chapter, the target functions associated with EPA radars are explained first (starting on the next page) followed by ATA/ARPA radars later in the chapter.

Electronic Plotting Aid (EPA) Radars

Manual Plotting of Targets

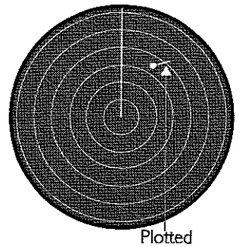
When manually plotting a target, the initial position of the target is marked and then the target position is marked again after a suitable time interval. From the two position marks and the interval between plots, the target's speed and course is calculated and displayed as a target vector (see Vector Mode in Chapter 5).



Before plotting a target, the user must select the required plot number by left or right clicking on the title line of the plot tote area. Any actions in the video circle will apply to the plot displayed in the tote. Manual plots are numbered from 1 to 10.

Plotting a Target

1. Position the cursor over the target in the video circle.
2. Left click to mark the target's initial position. (A second left click over the target, within 12 seconds, can be used to reposition it.)
3. After a minimum of 30 seconds, left click on the target again to mark its second position.
   The velocity of the target is then calculated and the target vector displayed accordingly. The vector position will be updated approximately once every scan taking own ship's motion into account, but a constant velocity is assumed for the target.
4. Continue plotting, by left clicking on the target, in order to update the calculated velocity and the target vector. Ensure that the target's associated plot number is displayed at the top of the tote area when updating.



Note *- If a plot has not been updated for 10 minutes, a PLOT UPDATE alarm is raised. If the calculated velocity is greater than 150 kt, the prompt 'Plot distance too big' is displayed and the plot is ignored.*

Cancelling Target Plotting

1. Position the cursor over a plotted target in the video circle.
2. Right click to cancel the target plotting.
   The target vector and associated target information are removed from the target.

Note *- Target plots will be cancelled automatically if their range exceeds the maximum plotting range or the time since the last plot exceeds 15 minutes.*

Target Plotting Limitations

- Manual plotting is only available on the range scales from 0.5 to 48 nm.
- If the compass fails, it will not be possible to plot any more targets. If the compass alarm is acknowledged, all target plots are cleared.
- If the radar is switched between stabilised and unstabilised presentation modes, all target plots are automatically cleared.
- If the radar is switched to standby, all target plots will be cancelled automatically.

Target Plotting Alarm Symbols

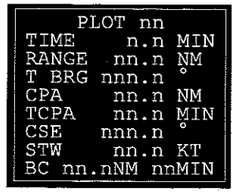
If an alarm is raised against a plotted target currently in the video circle, an alarm symbol is displayed (see below). This symbol flashes until the alarm is acknowledged. The alarm symbol then remains displayed as long as the alarm condition exists. Even if the target is not currently displayed in the video circle, an alarm will still be raised. The following alarm symbols, listed in order of priority, are used,

⫫ If a plotted target infringes the bow crossing limits, a BOW CROSSING alarm is raised.

△ If a plotted target infringes the CPA or TCPA limits, a CPA/TCPA alarm is raised.

If the interval between plots exceeds 10 minutes, a PLOT INTERVAL alarm is raised, and the plot number associated with the target will flash in RED.

Plot Data



Manually Plotted Target Data

The following data is shown;

PLOT	Target identification number.
TIME	The time elapsed since the last plot was made.
RANGE	Range of target from own ship.
T BRG	Bearing of target from own ship relative to true north.
CPA	Closest point of approach to own ship.
TCPA	Time to closest point of approach.
CSE/COG	Target's Course through the water (CSE) or Course Over the Ground (COG).
STW/SOG	Target's Speed Through the Water (STW) or Speed Over the Ground (SOG).
BC	Bow crossing distance and time.

The target, for which data is shown, can be selected by right clicking on the title in the plot tote area to reveal a numeric keypad. A left click on the title allows the number to be changed by moving the cursor control. The selected target is identified in the video circle by a green □ over the target.

Note that the Range and Bearing of a target is the Range and Bearing as measured from the Turning Unit (Radar Head). All target calculations are made with respect to the Radar Head.

Closest Approach and Bow Crossing Limits

The CPA, TCPA and BC (distance and time) limits can be viewed and changed as follows.

To View the Limits

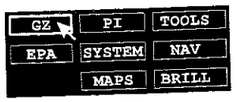
1. Position the screen cursor over the appropriate line in the plot tote area (CPA, TCPA, BC(distance) or BC(time).
2. Press and hold down the left key.
   The entered limit for the selected parameter is displayed in yellow for as long as the key is kept pressed.
3. Release the key.

Note *- Bow crossing information is not available on static radar installations.*

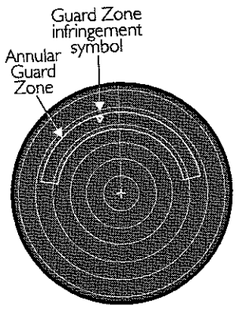
To Change the Limits

A right click on the CPA, TCPA, BC(distance) or BC(time) lines will reveal a drop down numeric keypad from which the required limit can be entered, see Chapter 15. Alternatively, the limits can be changed via the LIMITS & SETTINGS option of the EPA menu, see Chapter 8.

Guard Zones



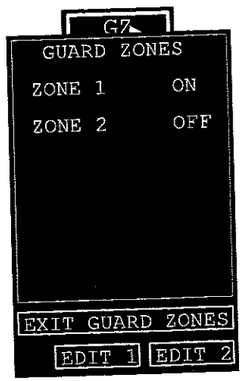
If the system is configured as an EPA then guard zones will be available instead of auto-acquisition zones. In this case, a **GZ** soft key (which replaces the **AZ** soft key) is used to select and define guard zones.



Two annular guard zones are available which are always displayed relative to own ship's head. Guard zones are active on all ranges but can only be displayed on the 3, 6 and 12 nm range scales in all motion and presentation modes. When a target enters a guard zone an alarm is raised.

If 60 infringements have been detected, a ZONES FULL alarm is raised.

Accessing the Guard Zones Menu



1. Position the screen cursor over the GZ soft key.
2. Left click to reveal the Guard Zones menu shown on the left.

A left click on the EXIT GUARD ZONES soft key will close the GUARD ZONES menu.

Turning Guard Zones On/Off

Note *- Guard zones retain their definitions when turned off.*

1. Position the screen cursor over a ZONE line in the menu.
2. Left click to toggle the selected zone ON and OFF.

Defining a Guard Zone

Note *- A guard zone is not active while it is being defined.*

1. Position the cursor over an EDIT soft key.
2. Left click to select edit mode for the associated guard zone.
3. Move the cursor to the centre of the video circle from where the zone can be edited. The other zone will temporarily be displayed at its last setting for reference purposes (provided the range in use is suitable), but will not detect any infringements unless it is currently ON. The selected zone is displayed in a different colour and the associated ZONE ON/OFF line in the menu shows EDIT.
4. Edit the zone as described in **Annular Zone Editing** later in this chapter.
5. Select another soft key (EDIT or EXIT GUARD ZONES) to store the new zone and automatically switch it on.

Automatic Targeting and Radar Plotting Aid (ATA/ARPA) Radars

Target Acquisition

Targets can be acquired manually by the operator or automatically using operator definable auto-acquisition zones. When a target enters an auto-acquisition zone, an alarm is raised and the target is automatically 'acquired'. Auto acquisition zones are available in all presentation and motion modes. Targets cannot be acquired within 0.25 nm of own ship.

Target Tracking Limitations

- When the maximum number of targets are being tracked, the TRACKS FULL alarm is raised and another target cannot be acquired until one or more targets are cancelled.
- If the radar is switched to standby, all targets will be cancelled automatically.
- Already acquired targets are dead reckoned **(DR)** when within 0.25 nm of own ship.

The integrity of ARPA and ATA tracking is a function of many variables which include clutter conditions, signal-to-noise ratio and sensor errors (log, compass, nav input etc.). The design of the tracker minimises the effects of these errors but the operator must be aware that such errors will produce discrepancies in derived tracked target information such as true speed, course, bearing, CPA and TCPA.

The possibility of target swop is minimised by the use of damped plot predictions in the tracker. The ARPA and ATA tracker employs advanced rain and sea clutter rejection techniques independent of the display settings. A fully established tracked target will not be affected by large levels of sea or rain clutter, however attempting to acquire a target at close range in severe clutter conditions, may cause the occasional appearance of the lost target symbol and its associated alarm.

When changing from one speed mode to another, and particularly between a water speed and a ground speed mode, the vectors take some time to resettle. Three minutes should be allowed to obtain full accuracy when switching between speed modes.

Compass Errors

If targets are being tracked, a compass error will cause affected target tote data to change from green to red. The affected data being TBRG, CPA, TCPA, COG(or CSE), SOG (or STW), BCR and BCT. After 1 minute all tracked targets will be cancelled; auto acquisition zones, mapping facilities, the constant radius turn and plots will be switched off and it will not be possible to use these facilities, or select a stabilised mode, until a valid compass heading is available. The system will reset to the H-Up presentation mode

Target Alarm Symbols

If an alarm is raised against a target currently in the video circle, an alarm symbol is displayed. This symbol flashes until the alarm is acknowledged. The alarm symbol then remains displayed as long as the alarm condition exists.

Even if the target is not currently displayed in the video circle, an alarm will still be raised. An unacknowledged alarm always has a higher priority than an acknowledged alarm. The following alarm symbols, listed in order of priority, are used,

◊ If the radar hasn't been able to obtain successfully the position of a target, which is being used as an echo reference, during the last three radar scans, a LOST REF alarm is raised.

⋕ If an acquired target infringes the bow crossing limits, a BOW CROSSING alarm is raised.

△ If an acquired target infringes the CPA and TCPA limits, a CPA/TCPA alarm is raised.

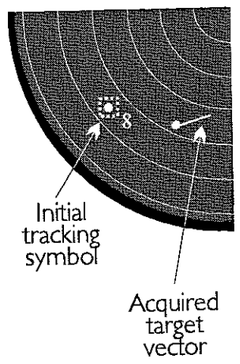
▽ When a target enters an auto-acquisition zone, an AZ ENTRY alarm is raised.

◊ If the radar hasn't been able to obtain successfully a target's position during the last six radar scans, a LOST TARGET alarm is raised.

Manual Acquisition of Targets

Manual acquisition is only available on range scales of 0.5 nm and above. When a target is acquired it is automatically assigned an identification number. Target numbering always starts at 1 and goes up to a maximum of 40. A target is assigned the next number in the sequence. Gaps which occur due to targets being cancelled or dropped, are not filled until the maximum number has been reached.

Acquiring a Target

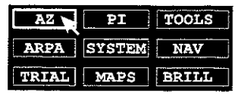


1. Position the cursor over the target in the video circle.
2. Left click to acquire the target.
   An initial tracking symbol is displayed centred on the target's estimated position. After 16 good plots, this initial tracking symbol is replaced by the target vector indicating the acquired target's speed and direction - see Vector Mode in Chapter 5.

Cancelling Target Acquisition

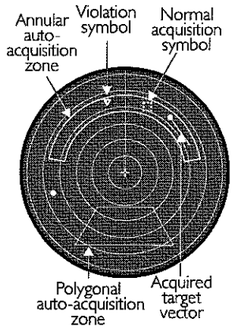
1. Position the cursor over an acquired target in the video circle.
2. Right click to cancel the target acquisition.
   The target vector and associated target information are removed from the target.

Auto-Acquisition Zones



If the system is configured as an ATA or an ARPA then auto-acquisition zones will be available. In this case, an **AZ** soft key is used to select and define the zones.

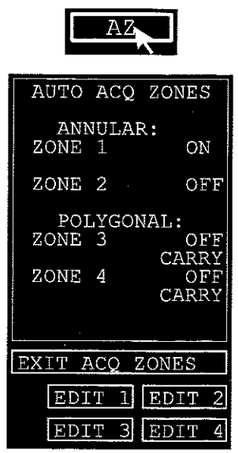
Two annular and two polygonal acquisition zones are available. Annular acquisition zones are always displayed relative to own ship's head. Auto-acquisition zones can only be displayed on range scales from 0.75 nm to 96 nm (annular zones), or from 0.5 nm to 96 nm (polygonal zones),



When a target enters an auto-acquisition zone, a AZ ENTRY alarm is raised and the auto-acquisition zone violation symbol is displayed. This flashes until the alarm is acknowledged, when the violation symbol is replaced by the normal acquisition symbol. After 16 good plots, the normal acquisition symbol is replaced by the target vector indicating the acquired target's speed and direction - see Vector Mode in Chapter 5.

When a target is acquired it is automatically assigned an identification number. Target numbering always starts at 1 and, for auto-acquisition, goes up to 40. A target is assigned the next unused number.

Accessing the Auto-acquisition Zones Menu



1. Position the screen cursor over the AZ soft key.
2. Left click to reveal the AUTO ACQ ZONES menu shown on the left.

A left click on the EXIT ACQ ZONES soft key will close the AUTO ACQ ZONES menu.

Turning Acquisition Zones On/Off

Note *- Acquisition zones retain their definitions when turned off.*

1. Position the screen cursor over a ZONE line in the menu.
2. Left click to toggle the selected zone ON and OFF.

Defining an Acquisition Zone

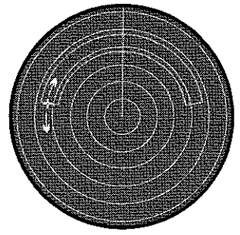
Note *- An acquisition zone is not active while it is being defined.*

1. Position the cursor over an EDIT soft key.
2. Left click to select edit mode for the associated zone.
   All other zones will temporarily be displayed at their last settings for reference purposes (provided the range in use is suitable), but will not detect any infringements unless they are currently ON. The selected zone is displayed in a different colour and the associated ZONE ON/OFF line in the menu shows EDIT.
3. For zones 1 and 2, edit the zone as described in **Annular Zone Editing**. For zones 3 and 4, edit the zone as described in **Polygonal Zone Editing**.
4. Select another soft key (EDIT or EXIT ACQ ZONES) to store the new zone and automatically switch it on.

Annular Zone Editing

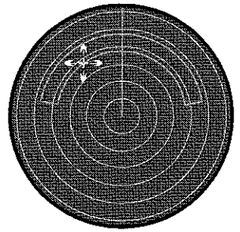
The following procedures apply to both guard zones (EPA Radars) and annular auto-acquisition zones (ATA/ARPA Radars).

Changing the Start/Stop Bearing



1. Position the cursor over the start or stop bearing as required.
   Note *- If the zone is a complete annulus (doughnut shaped), the start/stop bearing line will be displayed as an aid to editing.*
2. Press and hold down the left key.
3. Drag the start or stop bearing to its new position.
   Note *- If the zone is a complete annulus, dragging the bearing line alters the start bearing.*
4. Release the key.

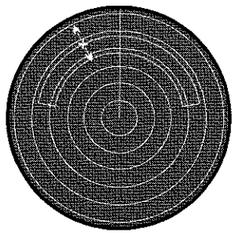
Changing the Range of a Zone



1. Place the cursor over the inner arc of the annulus.
2. Press and hold down the left key.
3. Drag the entire zone to its new position.
4. Release the key.

Altering the Depth of the Zone

Note *- This is only applicable to auto-acquisition zones. Guard zones are fixed at 0.4nm depth.*



1. Place the cursor over the outer arc of the annulus.
2. Press and hold down the left key.
3. Drag the outer arc to its new position.
4. Release the key.

Creating a New Zone

1. Place the cursor, away from the original zone, at the required start bearing and range.
2. Left click to define the initial range and bearing.
3. Left click again to define the end bearing and depth for the acquisition zone.

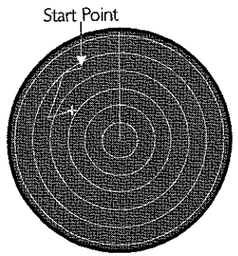
Notes
Left clicking twice on the same point will define a full annulus. The minimum width of a zone is 6° and the maximum is 354°, or 360°. Attempting to define a zone of more than 354° will result in a full circle (360°) zone.

Polygonal Zone Editing

The following procedure only applies to polygonal auto-acquisition zones. No default zones are defined, so each time a zone is selected for editing it must be created from scratch.

Important Note *- Any polygonal zone area within 1 nm of own ship, will not detect new targets.*

Defining a Zone



1. Left click at the required position to define the start point.
2. Left click again to define the next point. A mauve line will appear joining this point to the previous point.
3. Continue defining points by left clicking.
   A right click will delete the last line drawn.
4. Complete the polygon either by left clicking again on the start point, or by defining ten points (when it will be closed automatically). The zone will be switched-on automatically on completion.

Editing Warning Prompts

The warning promps listed below are associated with Polygonal Zone editing.

```
Angle too small (if <15°)
This side cannot cross another side
Zone too large
Not enough room-switch off other zones
```


Target Data

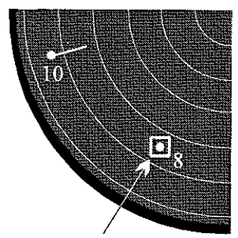
The target box defaults to showing data for a single target.

Acquired Target Data

```
TARGET nn/name
RANGE   nn.n NM
T BRG nnn.n °
CPA     nn.n NM
TCPA    nn.n MIN
CSE    nnn.n °
STW     nn.n KT
BCR     nn.n NM
BCT     nn   MIN
```

The following data is shown,

TARGET	Target identification number/name.
RANGE	Range of target from own ship.
T BRG	Bearing of target from own ship.
CPA	Closest point of approach to own ship.
TCPA	Time to closest point of approach.
CSE/COG	Target's Course through the water (CSE) or Course Over the Ground (COG)
STW/SOG	Target's Speed Through the Water (STW) or Speed Over the Ground (SOG)
BCR	Bow crossing range
BCT	Bow crossing time



Selected Target is shown with a box around it

The target, for which data is shown, can be selected by left clicking on an acquired target in the video circle. The selected target is identified in the video circle by a small '□' symbol centred on the plot origin.

Note that the Range and Bearing of a target is the Range and Bearing as measured from the Turning Unit (Radar Head). All target calculations are made with respect to the Radar Head.

Closest Approach and Bow Crossing Limits

The CPA/TCPA and BCR/BCT limits can be viewed and changed as follows.

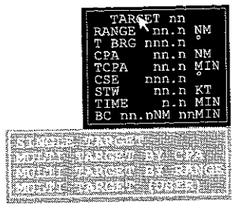
To View the Limits

1. Position the screen cursor over the appropriate line in the target box (CPA, TCPA, BCR or BCT).
2. Press and hold down the left key.
   The entered limit for the selected parameter is displayed in yellow for as long as the key is kept pressed.
3. Release the key.

To Change the Limits

A right click on the CPA, TCPA, BCR or BCT lines will reveal a drop down numeric keypad from which the required limit can be entered, see Chapter 15. Alternatively, the limits can be changed via the LIMITS & SETTINGS option of the ATA or ARPA menu, see Chapter 8.

Changing the Data Shown in the Target Box



1. Right click on the top line in the target box to reveal the drop down menu shown on the left . The current selection is highlighted.
2. Position the cursor over the required option in the menu.
3. Left click to select.

A left click on the top line of the target box will toggle between the single target display and whichever display was last selected.

Multiple Target Displays

Viewing Multiple Targets in Order of CPA

TARGET (CPA)		
ID	TCPA MINS	CPA NM
02	4.7	3.6
01	3.2	4.8
03	5.7	7.2
--	--.-	-.-
--	--.-	--.-
--	--.-	--.-

On selection of the MULTI TARGET BY CPA display option, up to 6 targets are listed in order of their CPA (lowest CPA at the top of the list) as shown in the example on the left. For each target, its ID number, TCPA and CPA are shown. Also, its ID number is shown against the target in the video circle. A left click on any of the targets in the list will switch to the single target display for that target.

Viewing Multiple Targets in Order of Range

TARGET (RANGE)		
ID	TCPA MINS	CPA NM
01	-3.2	4.8
02	4.7	3.6
03	5.7	7.2
--	--.-	--.-
--	--.-	--.-
--	--.-	--.-

On selection of the MULTI TARGET BY RANGE display option, up to 6 targets are listed in order of their range from own ship (closest range at the top of the list) as shown in the example on the left. For each target, its ID number, TCPA and CPA are shown. Also, its ID number is shown against the target in the video circle. A left click on any of the targets in the list will switch to the single target display for that target.

Viewing Up to 6 User Selected Targets

TARGET (USER)		
ID	TCPA MINS	CPA NM
03	5.7	7.2
01	-3.2	4.8
--	--.-	--.-
--	--.-	--.-
--	--.-	--.-
--	--.-	--.-

On selection of the MULTI TARGET (USER) display option, up to 6 user selected targets are listed as shown in the example on the left. For each target, its ID number, TCPA and CPA are shown. Also, its ID number is shown against the target in the video circle.

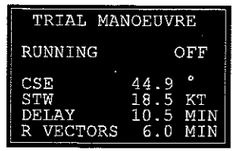
To include a target in the list, left click on an acquired target in the video circle. To remove a target from the list, right click on that target in the list. A left click on any of the targets in the list will switch to the single target display for that target.

Trial Manoeuvres

Note *- This option will only be available on a system which is configured as an ARPA.*

A trial manoeuvre can be carried out to see the effect of a proposed manoeuvre of own ship.

1. Position the screen cursor over the TRIAL soft key.



2. Left click to reveal the TRIAL MANOEUVRE menu shown in the example left.

Note *- Own ship's course and speed are used as the default settings in the Trial Manoeuvre menu. A right click at any time will exit the facility and remove the menu.*

Running a Trial Manoeuvre

Final Course of Own Ship

Enter the proposed course of own ship to be followed after the manoeuvre.

1. Left click on the COURSE line (CSE in the example) to activate.
2. Move the cursor control left or right to set the course required.
3. Left click to accept.

Speed of Manoeuvre

If you intend to change speed, enter the proposed speed of own ship to be maintained during and after the manoeuvre.

1. Left click on the SPEED line (STW in the example) to activate.
2. Move the cursor control left or right to set the required speed.
3. Left click to accept.

Manoeuvre Delay

Enter the proposed time delay between switching the trial manoeuvre ON and actually starting the manoeuvre.

1. Left click on the DELAY line to activate.
2. Move the cursor control left or right to set the required delay.
3. Left click to accept.

Vector Type

Select TRUE or REL (Relative) vector type as follows,

1. Position the screen cursor over the vector type selection field in the Trial Manoeuvre menu.
2. Consecutive left clicks will toggle the type between TRUE (**T**) and RELATIVE (**R**) VECTORS.

Vector Time

Enter the proposed vector time.

1. Position the screen cursor over the vector time field in the Trial Manoeuvre menu.
2. Left click to access.
3. Move the cursor control left or right to change the time.
4. Left click to accept.

Note *- Entering a longer vector time will allow you to see further into the trial manoeuvre. The above procedures (for Vector Type and Vector Time) will overwrite any selections made earlier (see Vector Mode in Chapter 5) and will remain in force until changed. If required, reset the vector time after the trial manoeuvre is completed.*

Manoeuvre Switch-ON

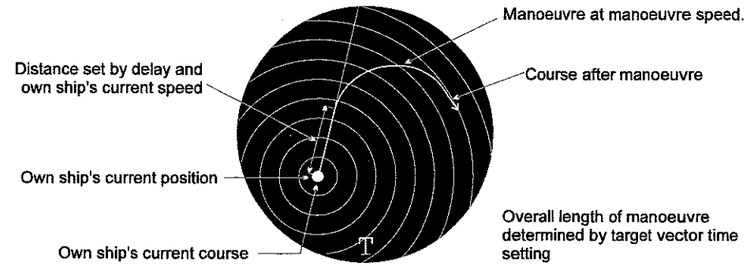
Left click on the RUNNING line to switch the manoeuvre ON. The 'manoeuvre delay' entered earlier will start to count down

The manoeuvre vectors are displayed until the time for the manoeuvre expires, or the manoeuvre is switched-OFF. (When the manoeuvre is running, a left click on the RUNNING line will switch-OFF the manoeuvre.)

The trial manoeuvre vectors are displayed when the trial manoeuvre is running and the dialog box is displayed. If the dialog box is exited while the manoeuvre is running the manoeuvre continues to run, even though the trial vectors are not displayed.

If true (T) vectors are selected, the trial vector is shown for own ship only, as shown in the example below. This shows own ship's true course during the manoeuvre.
If relative (R) vectors are selected, the trial vectors are applied to every acquired target, with own ship's vector suppressed, and show the course of the targets relative to own ship.

Note *- 'Vector type' (T or R vectors) and 'vector time' may be changed at any time before or during the manoeuvre.*

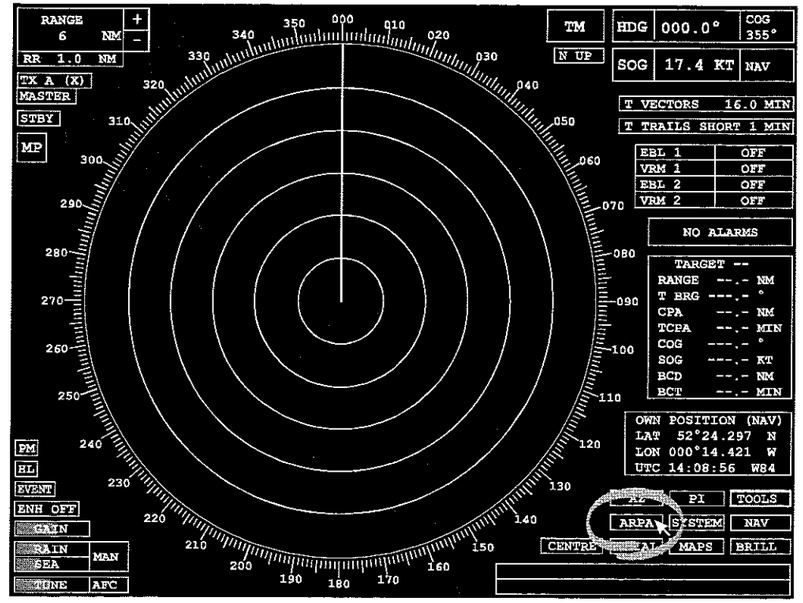


While the trial manoeuvre is running and the Trial Manoeuvre Menu is displayed, the letter 'T' will appear flashing at the bottom of the video circle. Once the delay has elapsed, the letter 'T' is removed from the display and the manoeuvre is turned OFF.

Note *- A MVR TIME alarm is raised 30 seconds before the manoeuvre is turned OFF.*

Intentionally Blank

CHAPTER 8
ARPA, ATA and EPA Functions



Covered in this chapter:

- Allocating names to acquired targets.
- Displaying target Ids and names in the video circle.
- Automatically dropping targets which are not a danger to own ship.
- Automatically dropping targets which move beyond a fixed limit behind ownship.
- Displaying dots to indicate the past positions for all acquired targets.
- Outputting data on tracked targets.